

What is Claimed is:

1           1.       A warming system for heating medical items to desired temperatures prior to  
2 using said medical items within medical procedures comprising:

3           a warmer unit including:

4                   a housing;

5                   a compartment disposed within said housing to receive at least one medical item  
6 to be heated;

7                   a medical item support structure to receive and secure said at least one medical  
8 item within said compartment;

9                   a heater to heat said compartment and said at least one medical item disposed  
10 therein;

11                  a controller to control said heater to heat said compartment to a desired  
12 temperature and to determine at least one of a time of insertion and a residence time for at least  
13 one medical item disposed within said compartment; and

14                  a display to display at least one of said determined insertion time and residence  
15 time for at least one medical item disposed within said compartment.

1           2.       The warming system of claim 1, wherein:

2           said medical item support structure includes at least one receptacle each to selectively  
3 receive and secure a medical item within said compartment and at least one sensing assembly  
4 each associated with a corresponding receptacle to detect the presence of said medical item  
5 disposed within said corresponding receptacle; and

6           said controller is coupled to each said sensing assembly and determines said residence  
7 time for each medical item disposed within said compartment based on information received  
8 from a corresponding sensing assembly.

1           3.       The warming system of claim 2, wherein said medical item support structure  
2 includes a drawer configured for removable insertion into said compartment.

1           4.       The warming system of claim 2, wherein said each sensing assembly includes a  
2 receptacle sensor to detect the presence of said medical item disposed within said corresponding  
3 receptacle.

1           5.       The warming system of claim 4, wherein said each sensing assembly further  
2 includes a signal circuit to provide a signal to said controller indicating the presence of said  
3 medical item within said corresponding receptacle when said signal circuit is in a closed state;  
4           wherein said each receptacle sensor includes a circuit member to close a corresponding  
5 signal circuit and provide said signal when a medical item is received within said corresponding  
6 receptacle and to open said corresponding signal circuit when said medical item is absent from  
7 said corresponding receptacle.

1           6.       The warming system of claim 5, wherein said controller includes at least one  
2 counter each associated with a corresponding receptacle to maintain said residence time for said  
3 medical item received within said corresponding receptacle in response to said signal provided  
4 by said corresponding signal circuit.

1           7.       The warming system of claim 5, wherein said contact member of said each  
2 receptacle sensor includes at least one temperature sensor to measure a temperature of said  
3 medical item disposed within said corresponding receptacle.

1           8.       The warming system of claim 5, wherein said each sensing assembly is disposed  
2 proximate a floor portion of a corresponding receptacle and said each contact member interfaces  
3 a corresponding signal circuit in response to forces applied by a medical item to that contact  
4 member upon insertion into the receptacle.

1           9.       The warming system of claim 4, wherein said each sensing assembly further  
2 includes a temperature sensor to measure a temperature of said medical item disposed within said  
3 corresponding receptacle.

1           10.     The warming system of claim 9 further including an input device to facilitate entry  
2 of desired temperatures for said compartment and each medical item contained therein.

1           11.     The warming system of claim 10 further including at least one alarm to indicate  
2 occurrence of a particular condition to a user.

1           12.     The warming system of claim 11, wherein said alarm includes at least one of a  
2 visual and audio indicator and said condition includes a measured temperature of a medical item  
3 disposed within a receptacle exceeding a corresponding desired temperature.

1           13.     The warming system of claim 2, wherein said controller determines said insertion  
2 time for each medical item disposed within said compartment indicating when that medical item  
3 is disposed within a corresponding receptacle in response to said corresponding sensing assembly  
4 detecting the presence of that medical item within said corresponding receptacle.

1           14.     The warming system of claim 10, wherein said display further displays for at least  
2 one medical item disposed within said compartment at least one of said corresponding desired  
3 temperature and said measured temperature of said medical item.

1           15.     The warming system of claim 14, wherein said display includes at least one  
2 display field each associated with a corresponding receptacle to display information associated  
3 with that receptacle.

1           16.     The warming system of claim 1, wherein said heater includes:  
2 a heating element; and  
3 a fan to direct air across said heating element to produce heated air and to direct said  
4 heated air into said compartment to heat said compartment and said at least one medical item  
5 contained therein.

1           17.     The warming system of claim 1, further comprising:

2 a plurality of said warmer units each individually controllable to heat said medical items  
3 to said desired temperatures, wherein said each warmer unit maintains a corresponding desired  
4 temperature and said warming system simultaneously heats said medical items contained within  
5 said warmer units to respective desired temperatures entered for said warmer units.

1 18. The warming system of claim 1, wherein said warmer unit further includes:  
2 a plurality of said compartments for heating said medical items to said desired  
3 temperatures, wherein each said compartment maintains a corresponding desired temperature;  
4 a plurality of said heaters each heating a corresponding compartment;  
5 a plurality of said medical item support structures each disposed within a corresponding  
6 compartment for receiving and securing at least one medical item within that compartment;  
7 a plurality of said controllers each to control said corresponding heater to heat said  
8 corresponding compartment to the desired temperature for that compartment and to determine  
9 at least one of said insertion time and residence time for at least one medical item disposed  
10 within that compartment; and  
11 a plurality of displays each associated with a corresponding compartment to display at  
12 least one of said determined insertion time and residence time for at least one medical item  
13 disposed within said corresponding compartment;  
14 wherein said warming unit simultaneously heats medical items contained within said  
15 compartments to respective desired temperatures entered for said compartments.

1 19. A carrier for use with a warming system for heating medical items to desired  
2 temperatures prior to using said medical items within medical procedures, said carrier  
3 comprising:  
4 a frame including an interior partitioned into a plurality of receptacles each to receive and  
5 retain a medical item therein; and  
6 a plurality of sensing assemblies each associated with and disposed proximate a  
7 corresponding receptacle to monitor that receptacle and said medical item contained therein;  
8 wherein said carrier is configured for removable insertion within a compartment of said  
9 warming system to facilitate heating of said medical items disposed within said receptacles.

1           20.     The carrier of claim 19, wherein said each sensing assembly includes a receptacle  
2 sensor to detect the presence of said medical item disposed within said corresponding receptacle.

1           21.     The carrier of claim 20, wherein said each sensing assembly further includes a  
2 signal circuit to provide a signal to a warming system controller indicating the presence of said  
3 medical item within said corresponding receptacle when said signal circuit is in a closed state;  
4           wherein said each receptacle sensor includes a circuit member to close a corresponding  
5 signal circuit and provide said signal when a medical item is received within said corresponding  
6 receptacle and to open said corresponding signal circuit when said medical item is absent from  
7 said corresponding receptacle.

1           22.     The carrier of claim 21, wherein said contact member of said each receptacle  
2 sensor includes at least one temperature sensor to measure a temperature of said medical item  
3 disposed within said corresponding receptacle.

1           23.     The carrier of claim 21, wherein said each sensing assembly is disposed proximate  
2 a floor portion of a corresponding receptacle and said each contact member interfaces a  
3 corresponding signal circuit in response to forces applied by a medical item to that contact  
4 member upon insertion into the receptacle.

1           24.     The carrier of claim 20, wherein said each sensing assembly further includes a  
2 temperature sensor to measure a temperature of said medical item disposed within said  
3 corresponding receptacle.

1           25.     In a warming system including a warmer unit including a compartment, a medical  
2 item support structure to receive and secure at least one medical item within said compartment,  
3 a heater to heat said compartment, a controller to control said heater and a display, a method of  
4 heating medical items to desired temperatures prior to using said medical items within medical  
5 procedures comprising the steps of:

- 6           (a)     receiving at least one medical item to be heated within said compartment;  
7           (b)     heating said compartment and said at least one medical item disposed therein via  
8 said heater;

9 (c) controlling said heater to heat said compartment to a desired temperature and  
10 determining at least one of a time of insertion and a residence time for at least one medical item  
11 disposed within said compartment; and

12 (d) displaying at least one of said determined insertion time and residence time for  
13 at least one medical item disposed within said compartment.

1 26. The method of claim 25, wherein said medical item support structure includes at  
2 least one receptacle each to selectively receive and secure a medical item within said  
3 compartment and at least one sensing assembly each associated with a corresponding receptacle,  
4 and step (a) further includes:

5 (a.1) detecting, via an associated sensing assembly, the presence of said medical item  
6 disposed within said corresponding receptacle; and

7 step (c) further includes:

8 (c.1) determining said residence time for each medical item disposed within said  
9 compartment based on information received from a corresponding sensing assembly.

1 27. The method of claim 26, wherein said each sensing assembly includes a  
2 receptacle sensor, and step (a.1) further includes:

3 (a.1.1) detecting the presence of said medical item disposed within said corresponding  
4 receptacle via an associated receptacle sensor.

1 28. The method of claim 27, wherein said each sensing assembly further includes a  
2 signal circuit to provide a signal to said controller indicating the presence of said medical item  
3 within said corresponding receptacle when said signal circuit is in a closed state, and step (a.1.1)  
4 further includes:

5 (a.1.1.1) closing a corresponding signal circuit, via a contact member of an  
6 associated receptacle sensor, to provide said signal when a medical item is received within said  
7 corresponding receptacle and opening said corresponding signal circuit when said medical item  
8 is absent from said corresponding receptacle.

1 29. The method of claim 28, wherein said controller includes at least one counter each  
2 associated with a corresponding receptacle, and step (c.1) further includes:

3 (c.1.1) maintaining said residence time for said medical item received within said  
4 corresponding receptacle via an associated counter in response to said signal provided by said  
5 corresponding signal circuit.

1 30. The method of claim 28, wherein said contact member of said each receptacle  
2 sensor includes at least one temperature sensor, and step (b) further includes:

3 (b.1) measuring a temperature of said medical item disposed within said corresponding  
4 receptacle via an associated contact member temperature sensor.

1 31. The method of claim 28, wherein said each sensing assembly is disposed  
2 proximate a floor portion of a corresponding receptacle, and step (a.1.1.1) further includes:

3 (a.1.1.1.1) interfacing a contact member to a corresponding signal circuit in response  
4 to forces applied by a medical item to that contact member upon insertion into the receptacle.

1 32. The method of claim 27, wherein said each sensing assembly further includes a  
2 temperature sensor, and step (b) further includes:

3 (b.1) measuring a temperature of said medical item disposed within said corresponding  
4 receptacle via an associated temperature sensor.

1 33. The method of claim 32, wherein said warming system further includes an input  
2 device, and step (a.1.1) further includes:

3 (a.1.1.1) facilitating entry of desired temperatures for said compartment and each  
4 medical item contained therein.

1 34. The method of claim 33, wherein step (b) further includes:

2 (b.1) indicating occurrence of a particular condition to a user via at least one alarm.

1 35. The method of claim 34, wherein step (b.1) further includes:

2 (b.1.1) indicating occurrence of a measured temperature of a medical item disposed  
3 within a receptacle exceeding a corresponding desired temperature via said alarm, wherein said  
4 alarm includes at least one of a visual and audio indicator.

1           36.     The method of claim 26, wherein step (c.1) further includes:

2           (c.1.1) determining said insertion time for each medical item disposed within said  
3     compartment indicating when that medical item is disposed within a corresponding receptacle  
4     in response to said corresponding sensing assembly detecting the presence of that medical item  
5     within said corresponding receptacle.

1           37.     The method of claim 33, wherein step (d) further includes:

2           (d.1)   displaying for each medical item disposed within said compartment at least one  
3     of said corresponding desired temperature and said measured temperature of said medical item.

1           38.     The method of claim 37, wherein said display includes at least one display field  
2     each associated with a corresponding receptacle, and step (d.1) further includes:

3           (d.1.1) displaying information associated with a receptacle within a corresponding display  
4     field.

1           39.     The method of claim 25, wherein said heater includes a heating element and a fan,  
2     and step (b) further includes:

3           (b.1)   directing air across said heating element to produce heated air and directing said  
4     heated air into said compartment to heat said compartment and said at least one medical item  
5     contained therein.

1           40.     The method of claim 25, wherein said warming system further includes a plurality  
2     of said warmer units each individually controllable to heat said medical items to said desired  
3     temperatures, wherein step (a) further includes:

4           (a.1)   receiving at least one medical item to be heated within compartments of at least  
5     two warmer units;

6           step (b) further includes:

7           (b.1)   heating said compartments of said at least two warmer units and said medical  
8     items disposed therein via corresponding heaters;

9           step (c) further includes:

10          (c.1)   controlling said heaters of said at least two warmer units to heat corresponding  
11     compartments to respective desired temperatures associated with those compartments and

determining at least one of said insertion time and residence time for at least one medical item within each of those compartments; and

step (d) further includes:

(d.1) displaying at least one of said insertion time and residence time for at least one medical item within each of said compartments of said at least two warmer units;

wherein said each warmer unit maintains a corresponding desired temperature and said warming system simultaneously heats said medical items contained within said warmer units to respective desired temperatures entered for said warmer units.

41. The method of claim 25, wherein said warmer unit further includes a plurality of said compartments for heating said medical items to said desired temperatures, wherein each said compartment maintains a corresponding desired temperature, a plurality of said heaters each heating a corresponding compartment, a plurality of said medical item support structures each disposed within a corresponding compartment for receiving and securing at least one medical item within that compartment, a plurality of said controllers each to control said corresponding heater to heat said corresponding compartment to the desired temperature for that compartment and a plurality of displays each associated with a corresponding compartment, and step (a) further includes:

(a.1) receiving at least one medical item to be heated within at least two compartments;

step (b) further includes:

(b.1) heating said at least two compartments and said medical items disposed therein via corresponding heaters;

step (c) further includes:

(c.1) controlling said heaters of said at least two compartments to heat those compartments to respective desired temperatures associated with those compartments and determining at least one of said insertion time and residence time for at least one medical item within each of said at least two compartments; and

step (d) further includes:

(d.1) displaying at least one of said determined insertion time and residence time for at least one medical item within each of said at least two compartments;

wherein said warming unit simultaneously heats medical items contained within said at least two compartments to respective desired temperatures entered for those compartments.

1           42.     A warming system for heating medical items to desired temperatures prior to  
2 using said medical items within medical procedures comprising:

3           a housing;

4           a compartment disposed within said housing to receive medical items to be heated;

5           a medical item support structure configured for removable insertion into said  
6 compartment and including a plurality of receptacles each to selectively receive and secure a  
7 medical item within said compartment and a plurality of sensing assemblies each associated with  
8 a corresponding receptacle to monitor that receptacle and said medical item disposed therein;

9           a heater to heat said compartment and said medical items disposed therein;

10          a controller to control said heater to heat said compartment to a desired temperature; and

11          a display to display information associated with each medical item disposed within said  
12 compartment, wherein said displayed information includes information from said sensing  
13 assemblies.

1           43.     The warming system of claim 42, wherein said each sensing assembly includes  
2 a receptacle sensor to detect the presence of said medical item disposed within said  
3 corresponding receptacle.

1           44.     The warming system of claim 43, wherein said each sensing assembly further  
2 includes a temperature sensor to measure a temperature of said medical item disposed within said  
3 corresponding receptacle.

1           45.     The warming system of claim 44 further including an input device to facilitate  
2 entry of desired temperatures for said compartment and each medical item contained therein.

1           46.     The warming system of claim 45, wherein said controller is coupled to each said  
2 sensing assembly and determines a residence time for each medical item disposed within said  
3 compartment based on information received from a corresponding sensing assembly.

1           47.     The warming system of claim 46, wherein said controller further determines an  
2 insertion time for each medical item disposed within said compartment indicating when that  
3 medical item is disposed within a corresponding receptacle in response to information received  
4 from said corresponding sensing assembly.

1           48.     The warming system of claim 47, wherein said display displays for each medical  
2 item disposed within said compartment at least one of said residence time, said insertion time,  
3 said corresponding desired temperature and said measured temperature of said medical item.

1           49.     In a warming system including a warmer unit including a compartment, a medical  
2 item support structure including a plurality of receptacles each to selectively receive and secure  
3 a medical item within said compartment and a plurality of sensing assemblies each associated  
4 with a corresponding receptacle, a heater to heat said compartment, a controller to control said  
5 heater and a display, a method of heating medical items to desired temperatures prior to using  
6 said medical items within medical procedures comprising the steps of:

- 7           (a)     receiving medical items to be heated within said receptacles;  
8           (b)     heating said compartment and said medical items disposed therein via said heater;  
9           (c)     controlling said heater to heat said compartment to a desired temperature;  
10          (d)     monitoring the receptacles and medical items disposed therein via the sensing  
11 assemblies; and  
12          (e)     displaying information associated with each medical item disposed within said  
13 compartment, wherein said displayed information includes information from said sensing  
14 assemblies.

1           50.     The method of claim 49, wherein said each sensing assembly includes a  
2 receptacle sensor, and step (d) further includes:

- 3           (d.1) detecting the presence of said medical item disposed within said corresponding  
4 receptacle via an associated receptacle sensor.

1           51.     The method of claim 50, wherein said each sensing assembly further includes a  
2 temperature sensor, and step (d) further includes:

3 (d.1) measuring a temperature of said medical item disposed within said corresponding  
4 receptacle via an associated temperature sensor.

1 52. The method of claim 51, wherein said warming system further includes an input  
2 device, and step (a) further includes:

3 (a.1) facilitating entry of desired temperatures for said compartment and each medical  
4 item contained therein.

1 53. The method of claim 52, wherein step (e) further includes:

2 (e.1) determining said residence time for each medical item disposed within said  
3 compartment based on information received from a corresponding sensing assembly.

1 54. The method of claim 53, wherein step (e) further includes:

2 (e.2) determining an insertion time for each medical item disposed within said  
3 compartment indicating when that medical item is disposed within a corresponding receptacle  
4 in response to information received from said corresponding sensing assembly.

1 55. The method of claim 54, wherein step (e) further includes:

2 (e.3) displaying for each medical item disposed within said compartment at least one  
3 of said residence time, said insertion time, said corresponding desired temperature and said  
4 measured temperature of said medical item.

1 56. A warming system for heating medical items to desired temperatures prior to  
2 using said medical items within medical procedures comprising:

3 a housing;

4 a compartment disposed within said housing to receive at least one medical item to be  
5 heated;

6 medical item support means for receiving and securing said at least one medical item  
7 within said compartment;

8 heating means for heating said compartment and said at least one medical item disposed  
9 therein;

10 control means for controlling said heating means to heat said compartment to a desired  
11 temperature and for determining at least one of a time of insertion and a residence time for at  
12 least one medical item disposed within said compartment; and

13 display means for displaying at least one of said determined insertion time and residence  
14 time for at least one medical item disposed within said compartment.

1 57. The warming system of claim 56, wherein said medical item support means  
2 includes at least one receptacle each to selectively receive and secure a medical item within said  
3 compartment and at least one sensing means each associated with a corresponding receptacle for  
4 monitoring that receptacle and including receptacle sensing means for detecting the presence of  
5 said medical item disposed within said corresponding receptacle, and wherein said control means  
6 determines said residence time for each medical item disposed within said compartment based  
7 on information received from a corresponding sensing means.

1 58. The warming system of claim 57, wherein said each sensing means further  
2 includes temperature sensing means to measure a temperature of said medical item disposed  
3 within said corresponding receptacle.

1 59. The warming system of claim 58, wherein said control means determines said  
2 insertion time for each medical item disposed within said compartment indicating when that  
3 medical item is disposed within a corresponding receptacle in response to said corresponding  
4 sensing means detecting the presence of that medical item within said corresponding receptacle.

1 60. The warming system of claim 59, wherein said display means further displays for  
2 each medical item disposed within said compartment at least one of said desired temperature and  
3 said measured temperature of said medical item.

1 61. A carrier for use with a warming system for heating medical items to desired  
2 temperatures prior to using said medical items within medical procedures, said carrier  
3 comprising:

4 a frame including an interior partitioned into a plurality of receptacles each to receive and  
5 retain a medical item therein; and

6 a plurality of sensing means each associated with and disposed proximate a corresponding  
7 receptacle for monitoring that receptacle and said medical item contained therein;

8 wherein said carrier is configured for removable insertion within a compartment of said  
9 warming system to facilitate heating of said medical items disposed within said receptacles.

1 62. The carrier of claim 61, wherein said each sensing means includes receptacle  
2 sensing means for detecting the presence of said medical item disposed within said corresponding  
3 receptacle.

1 63. The carrier of claim 62, wherein said each sensing means further includes  
2 temperature sensing means for measuring a temperature of said medical item disposed within  
3 said corresponding receptacle.

1 64. A warming system for heating medical items to desired temperatures prior to  
2 using said medical items within medical procedures comprising:

3 a housing;

4 a compartment disposed within said housing to receive medical items to be heated;

5 medical item support means configured for removable insertion into said compartment  
6 and including a plurality of receptacles each to selectively receive and secure a medical item  
7 within said compartment and a plurality of sensing means each associated with a corresponding  
8 receptacle for monitoring that receptacle and said medical item disposed therein;

9 heating means for heating said compartment and said medical items disposed therein;

10 control means for controlling said heating means to heat said compartment to a desired  
11 temperature; and

12 display means for displaying information associated with each medical item disposed  
13 within said compartment, wherein said displayed information includes information from said  
14 sensing means.

1 65. The warming system of claim 64, wherein said each sensing means includes  
2 receptacle sensing means for detecting the presence of said medical item disposed within said  
3 corresponding receptacle.

1           66.     The warming system of claim 65, wherein said each sensing means further  
2 includes temperature sensing means for measuring a temperature of said medical item disposed  
3 within said corresponding receptacle.

1           67.     The warming system of claim 66, wherein said control means is coupled to each  
2 said sensing means and determines a residence time for each medical item disposed within said  
3 compartment based on information received from a corresponding sensing means.

1           68.     The warming system of claim 67, wherein said control means further determines  
2 an insertion time for each medical item disposed within said compartment indicating when that  
3 medical item is disposed within a corresponding receptacle in response to information received  
4 from said corresponding sensing means.

1           69.     The warming system of claim 68, wherein said display means displays for each  
2 medical item disposed within said compartment at least one of said residence time, said insertion  
3 time, said desired temperature and said measured temperature of said medical item.